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Lawrence Sklar, *Philosophy and Spacetime Physics* (Berkeley: University of California Press, 1985). X + 335 pp., $27.50 (cloth).

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This book gathers twelve essays published by Sklar after his justly celebrated treatise *Space, Time, and Spacetime* (Berkeley: University of California Press, 1974). The author has added a general introduction, short summaries prefixed to each essay and an index of concepts and proper names. Five essays deal with very basic questions of philosophy of science, such as: What reasons can justify the choice of one scientific theory over another? Can a scientific theory be believed before every conceivable alternative has been weighed? Is it necessary, or indeed even possible to identify at least some facts of observation apart from any given theoretical framework? How does meaning accrue to theoretical terms from states of affairs "directly open to epistemic access" (p. 223)? The discussion of these questions is often illustrated with examples from spacetime physics. The remaining seven essays deal specifically with philosophical problems of space and time. However, the longest, "Facts, Conventions, and Assumptions in the Theory of Spacetime" (pp. 73-147), can also be classified in the first group, for it studies "the scope and limits of formalization as an aid to science" (p. 75) in the light of certain formalizations of Special and General Relativity. Sklar's work exemplifies contemporary philosophy of physics at its most exacting level, and we should congratulate the University of California Press for making his collected essays available in a handy, handsomely printed volume.

I had read most of these pieces separately, as they first appeared, one after the other, in several journals and conference proceedings. Presumably, I had then assimilated whatever lessons they held in store for me on the issues at hand, for now, on rereading them as a connected whole, they have prompted me to muse about more subjective matters. Namely, I have been led to wonder how their author, a learned and subtle writer, who cares for the same problems and reads much the same literature as I do, can nevertheless see some things so differently. Not that he openly endorses any tenet I would reject, for he advances with great care and usually withholds a final judgment on disputed questions. But the conclusions he reaches for—without quite reaching them—often are the ones which I consider less plausible. Such dissent readily spurs my relativist, nay, irrationalist inclinations. To fight them, I have tried my best to spot the points at which my thinking diverges from Sklar's and to find a reason for not following him. The reader will perhaps be interested in a sample of my findings, even if he does not mind my worries.

Let me begin with a minor yet significant matter. On p. 90 Sklar states the view that in the formalization of a physical theory "primitive terms should be only *those whose applicability or nonapplicability to a situation can be determined without in any way presupposing the truth of the theory in question*'' (my italics). Sklar does not avow this view as his own, but he gives it a respectful and sympathetic hearing. Now, J. Sneed (1971) and, in greater detail, U. Gähde (1983) have shown that in Newtonian mechanics the italicized condition is not met by the key terms *force* and *mass*. In my opinion, *position* and *time* do not meet it either, but I do not have to press this point here, as it is plain that any formalization of the said theory must count *force* and *mass* among its primitives, unless, say, in the manner of Hertz (1894), it substitutes other, no less questionable terms for them. Once it is understood that such basic theories of physics cannot be formalized in a manner consonant with the above requirement, one must of course scrap the foundationist philosophy that lurks behind it, and which Sklar persistently and, it would seem, nostalgically strives to resuscitate.

Essays 9, 10 and 12 deal with the causal theory of time and with the alleged link between time's ''directedness'' (as expressed, e.g., by Vergil's *fugit irreparabile tempus*) and entropy increase. I should say that all three are among the best papers I have read on the subject. But I am left wondering why Sklar pays any attention to it. Perhaps our difference on this matter stems from our widely divergent attitudes to the philosophy of Hans Reichenbach. Sklar does not subscribe to it any more than I do, but it has impressed him deeply. He is visibly enthralled by Reichenbach's fruitless and to my mind quixotic endeavor to separate the factual grain from the conventional chaff in science. And at one point he almost apologizes for not accepting Reichenbach's arguments on time and entropy as conclusive (p. 319). Now, I do not doubt that Reichenbach possessed qualities which earned him, among the scholars who knew him, an admiration I have been unable to develop by merely studying his books. But his purported reduction of temporal to causal relations is to me the quintessential *explicatio per obscurius*. And I think that his laborious attempt to ground the direction of time on Boltzmann's statistical-mechanical reading of the Second Principle of Thermodynamics turns on one big confusion. For time order is one thing, and the irreversibility of (some) physical processes is quite another. Moreover, the latter presupposes the former: what irreversibility means is that events which usually follow upon certain other events never or only very rarely precede them, and, of course, an independent concept of temporal precedence is required to make sense of this description. Indeed, Boltzmann's account of irreversibility rests squarely on the difference between time future and time past, and cannot therefore provide an explication of that difference. He conceived the entropy pertaining to a state T of a physical system S as the logarithm of the probability that S might be in state T. But then, a significant probability distribution can only be ascribed to a spectrum of open options, and its range collapses to the trivial pair $\{0,1\}$ the very instant they become closed. (A past toss of a fair coin *had* a 0.5 probability of turning up heads, but it does not *have* it. I can sensibly and in good conscience give you even odds on that outcome, but only if I am and I believe that you are still ignorant about it, so that the option still is open *quoad nos*.)

I turn finally to essay 5, ''Modestly radical empiricism'', which, together with essay 7, ''Semantic analogy'', goes furthest in making explicit Sklar's general philosophical position. Here he takes on two philosophical straw men, the Naturalist and the Pragmatist, both of whom hold that ''the observational/nonobservational distinction is highly context-dependent and relative'' (p. 171; cf. p. 172). Sklar argues that the absolute, theory-independent distinction between what is and what is not observable has played a decisive role at two turning points in the development of 20th century physics, viz, the elimination of the ether frame in Einstein's Special Theory of Relativity (1905) and the elimination of global inertial frames in his General Theory of Relativity (1915). According to Sklar, ''for Einstein's arguments to be the least bit persuasive we must be assured, in a manner independent of the theories proposed and ultimately accepted, that there are nonrelative, non-contextual limits on the domain of what is to be counted as observable''. No matter whether one is a realist or an instrumentalist, a conventionalist, a Bayesian or whatever, ''the very structuring of the scientific decision process requires that one not be prepared to challenge Einstein's hard, context-independent, and irrevocable limitation on the domain of the observable'' (p. 175).

For my part, I gleefully own to the Pragmatist's sinful ways. But, of course, I read Einstein's writings somewhat differently. In the first place, I do not see that the limits he set to the domain of the observable, excluding from it the ether frame, are either context-independent or irrevocable. Einstein (1920) himself noted that General Relativity had somehow reinstated the banned ether; and in effect we have lived to see it return to observability with a vengeance in the guise of Penzias and Wilson's isotropic background thermal radiation, which provides, *in the context of General Relativity*, not only a fixed standard of motion and rest, but also—at least, in principle—an absolute cosmic clock.

Looking now into Einstein's feat of 1905, I do not find that it *rests* on a hard and fast pre-theoretical intuition of what is and what is not observable. What Einstein did was to show that two principles which had until then been judged inconsistent, namely, the Principle of Relativity (applied to inertial systems) and the Principle of the Constancy of the Speed of Light, were perfectly compatible. To prove it, Einstein had to produce a precise definition of the time coordinate belonging to a given inertial system, as a function of position and time-at-the-origin. Such a definition had never been given before, not because earlier physicists believed that the time of distant events can be known ''non-inferentially'' (p. 175, line 12), as a poet might say we know distant colors; but simply because such conceptual precision seemed unwarranted given the imprecision of measurement. (Cf. Thomson 1884, p. 569.) Under the said two Principles the Maxwell equations hold equally well when referred to any inertial system. Thus, (theory-laden) electromagnetic observations no longer justify the postulation of a motionless ether. The Principles, however, jointly entailed some bold, baffling predictions. Had these not been corroborated, the Lorentz ether could have regained currency, and far from remaining "unobservable in a rigorous, non-context-dependent way" (p. 181), become observable in the only way in which its partisans had ever expected to observe it, namely, through its effects on laboratory equipment, as conceived in the light of current theory.

Einstein's elimination of global inertial frames, which Sklar rightly traces back to the Equivalence Principle (Einstein 1907, §17), prompts analogous reflections. Einstein saw early on that the frame-dependence of inertia entailed by the two Principles mentioned above cannot be readily reconciled with the well-entrenched (and well-corroborated) identification of inertial mass with gravitational charge. This persuaded him that within the frame of the special theory of relativity there was no room for a satisfactory treatment of gravity. It then lighted on Einstein that a freely falling man does not feel his own weight—something that now any child would guess from watching astronauts on television. He translated this insight into a physical principle: There is no way of distinguishing between an inertial frame and a frame falling freely in a uniform gravitational field. If we grant that free fall in a uniform gravitational field is always a local phenomenon (occurring over a short distance for a short while), it follows at once that there are no global inertial frames. Moreover, if free fall is—at any rate locally—like inertial motion, and therefore knows of no distinctions between bodies of different composition, it is evidently impossible to measure any difference between inertial and gravitational mass. But such impossibility is just a logical consequence of the Equivalence Principle, not the manifestation of "an aprioricity of what is observable" (p. 177, line 18). Indeed, the latest theories of fundamental physics do imply that a discrepancy between gravitation and inertia should be detectable in experiments of a hitherto impracticable level of precision.

I am therefore unable to share Sklar's judgment that Einstein's "critiques [of prerelativistic physics], *however they are to be read*, seem to require an absolute notion of at least nonobservability to get them under way" (p. 177, my emphasis). I expect, however, that the foregoing discussion will not appear to detract from the significance of Sklar's book, but will whet the reader's appetite to look into it and see for himself.

REFERENCES

Einstein, Albert

1905 "Zur Elektrodynamik bewegter Körper". *Annalen der Physik*. (4) **17**: 891-921.

1907 "Über das Relativitätsprinzip und die aus demselben gezogenen Folgerungen". *Jahrbuch der Radioaktivität und Elektronik*. **4**: 411-462.

1915 "Die Feldgleichungen der Gravitation". *K. Preußische Akademie der Wissenschaften Sitzungsberichte. Phys.-Math. Klasse*. Pp. 844-847.

1920 *Äther und Relativitätstheorie. Rede gehalten am 5. Mai 1920 an der Reichs-Universität zu Leiden*. Berlin: Springer.

Gähde, Ulrich

1983 *T-Theorizität und Holismus*. Frankfurt a.M./Bern: Peter Lang.

Hertz, H.

1894 *Die Prinzipien der Mechanik in neuem Zusammenhang dargestellt*. Leipzig. (Reprinted, Darmstadt: Wissenschaftliche Buchgesellschaft, 1963.)

Sneed, Joseph D.
1971 *The Logical Structure of Mathematical Physics*. Dordrecht: D. Reidel.

Thomson, James
1884 "On the Law of Inertia, the Principle of Chronometry and the Principle of Absolute Clinural Rest, and of Absolute Rotation". *Royal Society of Edinburgh Proceedings*. **12**: 568-578.

Joseph Margolis, *Pragmatism Without Foundations: Reconciling Realism and Relativism* (Oxford and New York: Basil Blackwell, 1986), xix + 320 pp. cloth $34.95.

PETER H. HARE
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Educated at Columbia in the pragmatic tradition, Joseph Margolis has since published extensively in the analytic tradition. His broad sympathies have led him also to read deeply in recent Continental philosophy. Although an increasing number of philosophers take the trouble to read at least superficially in more than one tradition. I know of no one who has mastered the full range of recent philosophy as Margolis has. Moreover, his knowledge is not merely encyclopedic; it is put to work in developing Margolis's own philosophical views.

In the book under review, the first volume of a trilogy, Margolis develops pragmatist doctrines in the idiom of analytic philosophy while also using the resources of European philosophy. Although many would describe Richard Rorty's work in the same way, Margolis's pragmatism is crucially different from Rorty's. Margolis uses the full range of contemporary philosophy to develop the type of realism that is the core of the pragmatic tradition whereas Rorty develops only the deconstructive aspects of pragmatism. Rorty has done much to make analytically trained philosophers aware of the relevance of pragmatism to today's philosophical problems, but Margolis is genuinely advancing the pragmatic tradition. Although Margolis is joined in this by John E. Smith, Richard Bernstein, Sandra Rosenthal, and others, no one else engaged in this effort has Margolis's mastery of the technical literature in epistemology, philosophy of science, and philosophy of language. Hilary Putnam, who obviously has such mastery, is working only partly in the pragmatic tradition.

Margolis addresses what many consider the central concern of philosophy today—how to legitimate realism in the face of ever more intricate arguments for relativism (and more generally the maneuvers of the 'postmodernists'). He tackles this problem in its full force. In "reconciling realism and relativism" (his subtitle), he resists the temptation to